


GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

MEMORANDUM

DATE: October 31, 2011  
TO: Chris Lanane, Steve Mobley  
FROM: Mike Horn   
SUBJECT: Quality Assurance Audit Report

Attached is the draft version of the document, "Great Basin Unified Air Pollution Control District Quality Assurance Audit Report, Dirty Socks, October 31, 2011," for your review. Please refer any comments you may have on the document to me by January 3, 2012. If no comments are received by that date, the report will be considered final.

Thank you for your cooperation in this matter.

Great Basin Unified Air Pollution Control District  
Quality Assurance  
Audit Report

SITE:  
**DIRTY SOCKS**

Report Date: October 31, 2011  
Prepared by: Mike S. Horn

## 1.0 Introduction

As part of the Great Basin Unified Air Pollution Control District's (District) quality assurance (QA) program, periodic audits are conducted on the monitoring stations throughout the District. These checks, which are conducted by personnel other than those associated with the day-to-day operation and maintenance of the stations, provide additional assurance that the data collected are of high quality and meet the project objectives. The achievement of these objectives can be determined, in part, by establishing criteria within which monitoring equipment is to be operated and then testing that equipment regularly to verify its operation within those criteria.

In keeping with the District's QA program goals, the T.E.O.M. PM-10 Monitoring Station at Dirty Socks was audited on October 31, 2011. The audit was conducted by Mike Horn and was witnessed by Steve Mobley, who is the site operator.

## 2.0 Parameters Audited:

T.E.O.M. PM-10

## 3.0 Results and Actions

The results of the audit are summarized below. Any problems found are addressed under the heading, "Action," and are given below. Sensor responses not specifically addressed below responded within the audit criteria limits. The audit data are presented in detail in Appendix A. The certifications of the audit devices are presented in Appendix B. Audit criteria based on Title 40 code of Federal Regulations Part 58, Appendix A (October 2006), the USEPA Quality Assurance Handbook for Air Pollution Measurement Systems Volumes II, 1997, and IV, 2007, and/ or on the manufactures recommendations, are presented in table A-1.

## 4.0 Recommendations and Comments

There are no recommendations or comments at this time.

## APPENDIX A

Great Basin Unified Air Pollution Control District  
Tapered Element Oscillating Microbalance (TEOM)  
AUDIT

Date of report: 10/31/11  
Date: 10/31/11  
Start: 10:10hrs. PST  
Finish: 10:30hrs. PST  
Audited By: Mike Horn  
Witness: Steve Mobley

Prop. or Serial No.: 225500  
Type: PM-10

Site name: Dirty Socks  
Operator: Steve Mobley  
Project: SB 270  
Site Elevation: 3590 ft.  
Amb. Pres.: 899.70 hPa  
Amb. Temp.: 15.1 deg. C  
Make: R & P  
Model: 1400ab  
Last cal. date: 8/17/11

AUDIT DEVICE(S)

Make: BGI Incorporated  
Model: DELTA CAL  
S/N: 525  
Range: 2 - 20 lpm

Calibration Factors

Slope: 1.00  
Intercept: 0.00  
Cal date: 1/4/11

Main: Aux:

Leak check: 0.050 0.300  
Dark current: N/A N/A

$$Qa=[dPxTa/Pa]^{1/2}+b$$

Make: BGI Incorporated  
Model: DELTA CAL  
S/N: 525  
Range: 2 - 20 lpm

Calibration Factors

Slope: 1.00  
Intercept: 0.00  
Cal Date: 1/4/11

Diff. Sampler press: Diff.  
1.8 898.53 -1.2

Sampler temp: 16.9

Audit Point	Audit Flow Rate, $Qa=[dPxTa/Pa]^{1/2}+b$		Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates	
	$\Delta P$ , in. H <sub>2</sub> O	(VLPM)			Lower Limit (LPM)	Upper Limit (LPM)
Total Flow Rate	16.89	16.89	16.66	-1.4	15.0	18.4
Bypass/Aux Flow Rate	13.87	13.87	13.66	-1.5		
Main Flow Rate	2.98	2.98	3.00	0.7	2.7	3.3
Total Flow Rate	16.98	16.98	16.66	-1.9	15.0	18.4

Comments: None.

TABLE A-1

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT  
QUALITY ASSURANCE PERFORMANCE AUDIT CRITERIA

<u>Measurement Variable</u>	<u>Evaluation Criteria</u>
Wind Speed	At $ws \leq 5$ m/s, input $\pm 0.25$ m/s; At $ws > 5$ m/s, input $\pm 5\%$ Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor and NRG Max 40H
Wind Direction	input $\pm 5^\circ$ Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor
Temperature	input $\pm 0.5^\circ$ C Gravimetry Lab $\pm 1.0$ deg. C input $\pm 2.0^\circ$ C for PM-10, PM-2.5 samplers
Relative Humidity	Ambient: input $\pm 5\%$ RH, $\pm 1.5^\circ$ C as dew point Gravimetry Lab: input $\pm 5\%$
Precipitation	input $\pm 10\%$
Barometric Pressure	Ambient: input $\pm 10$ hPa TEOM: $\pm 10$ mm mercury
PM-10: Hi-Vol SSI, Partisol, BGI, PM-2.5	input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 4\%$ ; Design Flow $\pm 5\%$
TEOM: Total Flow Main Flow Bypass Flow	input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 10\%$ ; Design Flow $\pm 10\%$
TEOM: Leak Check	Main Flow: $< 0.15$ LPM Bypass Flow: $< 0.60$ LPM

## Appendix B

### GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT QUALITY ASSURANCE CERTIFICATIONS OF AUDIT DEVICES

#### AUDIT DEVICE

	<u>Serial #</u>	<u>Cal Date:</u>	<u>Slope:</u>	<u>Intercept:</u>
BGI Delta CAL:	123	1/24/11	1.0	0.0
BGI Delta CAL:	525	1/4/11	1.0	0.0
Testo 735-1	01467895/712	12/16/10	1.0006	0.0209
Barigo Altimeter/Barometer:	P9	12/17/10	1.0	0.0
RM Young wind speed motor:	CU10, HS10	8/30/11	N/A	N/A
Psychro-Dyne Psychrometer:	RH 04	N/A	1 0	1 0
Texas Electronics FC-525 Precipitation:	52202	N/A		
Chinook Eng. Streamline FTS	108	9/8/10	0.41	0.6

**Great Basin Unified Air Pollution Control District  
Tapered Element Oscillating Microbalance (TEOM)**

**FLOW AUDIT**

Date: 10/3/11  
Start: 10:16  
Finish: 10:30

PST  
PST

Site Name:  
Operator:  
Project: SB270

Site Elevation: ft  
Amb. Press.: 899.7 in. Hg  
Amb. Temp.: 15.7 deg. C

Prop. Or Ser. No.: 22508  
Type: PM10

Make: R&P  
Model: 1400a  
Last Cal. Date: 6/17/11

**Audit Device(s)**

Make: BGI INCORPORATED  
Model: DELTA CAL  
S/N: 0123-525  
Range: 2 - 20 lpm

**Calibration factors:**

Slope: 1.0  
Int.: 0.0  
Cal Date: 1/4/11

Make: BGI INCORPORATED  
Model: DELTA CAL  
S/N: 0123  
Range: 2 - 20 lpm

**Calibration factors:**

Slope: 1.0  
Int.: 0.0  
Cal Date:

$$Q_a = m[dP \times T_a / P_a]^{1/2} + b$$

Altitude Correction Factor:  $\div 1013$

Leak Check-Initial Main: .05 Aux: .03  
Leak Check-Final Main: .03 Aux: .03

Audit Point	Site		Diff. (%)	Nominal Flow Rates	
	Audit Flow Rate delta P	Flow Rate (VLPM)		Lower Limit (LPM)	Upper Limit (LPM)
Total Flow Rate	16.89	3.66 / 13.66 = 16.66		15.0	18.4
Aux. Flow Rate	13.87	13.66			
Main Flow Rate	2.98	3.00		2.7	3.3
Total Flow Rate	16.78	16.66		15.0	18.4

	Standard	
	Sampler	Raw
Amb Temp	16.9	15.1
Amb Press	887	898.53

Comments:


Calibrated By:

*Mike [Signature]*



GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

MEMORANDUM

DATE: July 15, 2011  
TO: Chris Lanane, Steve Mobley  
FROM: Mike Horn   
SUBJECT: Quality Assurance Audit Report

Attached is the draft version of the document, "Great Basin Unified Air Pollution Control District Quality Assurance Audit Report, Dirty Socks, July 15, 2011," for your review. Please refer any comments you may have on the document to me by September 15, 2011. If no comments are received by that date, the report will be considered final.

Thank you for your cooperation in this matter.

Great Basin Unified Air Pollution Control District  
Quality Assurance  
Audit Report

**SITE:**  
**DIRTY SOCKS**

Report Date: July 15, 2011  
Prepared by: Mike S. Horn

## 1.0 Introduction

As part of the Great Basin Unified Air Pollution Control District's (District) quality assurance (QA) program, periodic audits are conducted on the monitoring stations throughout the District. These checks, which are conducted by personnel other than those associated with the day-to-day operation and maintenance of the stations, provide additional assurance that the data collected are of high quality and meet the project objectives. The achievement of these objectives can be determined, in part, by establishing criteria within which monitoring equipment is to be operated and then testing that equipment regularly to verify its operation within those criteria.

In keeping with the District's QA program goals, the T.E.O.M. PM-10 Monitoring Station at Dirty Socks was audited on July 14, 2011. The audit was conducted by Mike Horn and was witnessed by Steve Mobley, who is the site operator.

## 2.0 Parameters Audited:

T.E.O.M. PM-10

## 3.0 Results and Actions

The results of the audit are summarized below. Any problems found are addressed under the heading, "Action," and are given below. Sensor responses not specifically addressed below responded within the audit criteria limits. The audit data are presented in detail in Appendix A. The certifications of the audit devices are presented in Appendix B. Audit criteria based on Title 40 code of Federal Regulations Part 58, Appendix A (October 2006), the USEPA Quality Assurance Handbook for Air Pollution Measurement Systems Volumes II, 1997, and IV, 2007, and/ or on the manufactures recommendations, are presented in table A-1.

## 4.0 Recommendations and Comments

There are no recommendations or comments at this time.

## APPENDIX A

Great Basin Unified Air Pollution Control District  
Tapered Element Oscillating Microbalance (TEOM)  
AUDIT

Date of report:	7/15/11	Site name:	Dirty Socks
Date:	7/14/11	Operator:	Steve Mobley
Start:	11:30hrs. PST	Project:	SB 270
Finish:	11:50hrs. PST	Site Elevation:	3590 ft.
Audited By:	Mike Horn	Amb. Pres.:	887.20 hPa
Witness:	Steve Mobley	Amb. Temp.:	28.9 deg. C
Prop. or Serial No.:	225500	Make:	R & P
Type:	PM-10	Model:	1400ab
		Last cal. date:	5/11/11

AUDIT DEVICE(S)

Make: BGI Incorporated  
Model: DELTA CAL  
S/N: 525  
Range: 2 - 20 lpm

Calibration Factors

Slope: 1.00  
Intercept: 0.00  
Cal date: 1/4/11

	Main:	Aux:
Leak check:	0.040	0.120
Dark current:	N/A	N/A

$$Qa=[dPxTa/Pa]^{1/2}+b$$

Make: BGI Incorporated  
Model: DELTA CAL  
S/N: 525  
Range: 2 - 20 lpm

Calibration Factors

Slope: 1.00  
Intercept: 0.00  
Cal Date: 1/4/11

Diff.	Sampler press:	Diff.
-1.2	885.36	-1.8

Sampler temp: 27.7

Audit Point	Qa=[dPxIa/Pa] <sup>1/2</sup> +b		Site	Diff. (%)	Nominal Flow Rates	
	Audit Flow Rate,		Flow Rate		Lower Limit	Upper Limit
	ΔP, in. H2O	(VLPM)	(VLPM)		(LPM)	(LPM)
Total Flow Rate	16.99	16.99	16.66	-1.9	15.0	18.4
Bypass/ Aux Flow Rate	13.96	13.96	13.66	-2.1		
Main Flow Rate	3.07	3.07	3.00	-2.3	2.7	3.3
Total Flow Rate	16.96	16.96	16.66	-1.8	15.0	18.4

Comments: None.

## Appendix B

### GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT QUALITY ASSURANCE CERTIFICATIONS OF AUDIT DEVICES

#### AUDIT DEVICE

	<u>Serial #</u>	<u>Cal Date:</u>	<u>Slope:</u>	<u>Intercept:</u>
BGI Delta CAL:	123	1/24/11	1.0	0.0
BGI Delta CAL:	525	1/4/11	1.0	0.0
Testo 735-1	01467895/712	12/16/10	1.0006	0.0209
Barigo Altimeter/Barometer:	P9	12/17/10	1.0	0.0
RM Young wind speed motor:	CUO1, HSO1	12/3/10	N/A	N/A
Cole-Parmer 3312-40 Psychrometer:	RH 03	12/10/04	Wet 1.0037	Wet -0.0598
			Dry 1.0059	Dry -0.1518
Texas Electronics FC-525 Precipitation:	52202	N/A		
Chinook Eng. Streamline FTS	108	9/8/10	0.41	0.6

TABLE A-1

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT  
QUALITY ASSURANCE PERFORMANCE AUDIT CRITERIA

<u>Measurement Variable</u>	<u>Evaluation Criteria</u>
Wind Speed	At $ws \leq 5$ m/s, input $\pm 0.25$ m/s; At $ws > 5$ m/s, input $\pm 5\%$ Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor and NRG Max 40H
Wind Direction	input $\pm 5^\circ$ Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor
Temperature	input $\pm 0.5^\circ$ C input $\pm 2.0^\circ$ C for PM-10, PM-2.5 samplers
Relative Humidity	Ambient: input $\pm 5\%$ RH, $\pm 1.5^\circ$ C as dew point Gravimetry Lab: input $\pm 5\%$
Precipitation	input $\pm 10\%$
Barometric Pressure	Ambient: input $\pm 10$ hPa TEOM: $\pm 10$ mm mercury
PM-10: Hi-Vol SSI, Partisol, BGI, PM-2.5	input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 4\%$ ; Design Flow $\pm 5\%$
TEOM: Total Flow Main Flow Bypass Flow	input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 10\%$ ; Design Flow $\pm 10\%$
TEOM: Leak Check	Main Flow: $< 0.15$ LPM Bypass Flow: $< 0.60$ LPM

**Great Basin Unified Air Pollution Control District  
Tapered Element Oscillating Microbalance (TEOM)**

**FLOW AUDIT**

Date: 7/14/11  
Start: 11:30  
Finish: 11:50

PST  
PST

Site Name:  
Operator:  
Project: SB270

Site Elevation:

Amb. Press.: 887.7 ft  
Amb. Temp.: 28.9 in. Hg deg. C

Prop. Or Ser. No.: 22508  
Type: PM10

Make: R&P  
Model: 1400a  
Last Cal. Date: 5/11/11

**Audit Device(s)**

Make: BGI INCORPORATED  
Model: DELTA CAL  
S/N: 0123-525  
Range: 2 - 20 lpm

Make: BGI INCORPORATED  
Model: DELTA CAL  
S/N: 0123  
Range: 2 - 20 lpm

**Calibration factors:**

Slope: 1.0  
Int.: 0.0  
Cal Date: 1/4/11

**Calibration factors:**

Slope: 1.0  
Int.: 0.0  
Cal Date:

$$Q_s = m[dP \times T_2 / P_2]^{1/2} + b$$

Altitude Correction Factor:  $\div 1013$

**Leak Check-Initial**

Main: .04

Aux: .12

**Leak Check-Final**

Main:

Aux:

Audit Point	Audit Flow Rate		Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates	
	delta P	(VLPM)			Lower Limit (LPM)	Upper Limit (LPM)
Total Flow Rate	16.99		3.00/13.66 = 16.66		15.0	18.4
Aux. Flow Rate	13.96		13.66			
Main Flow Rate	3.07		3.00		2.7	3.3
Total Flow Rate	16.96		16.66		15.0	18.4

**Standard**

	Sampler	True	Raw
Amb Temp	27.7		28.9
Amb Press	887.4	885.36	887.2

Comments:


Calibrated By:

*Mike [Signature]*



GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

MEMORANDUM

DATE: May 10, 2011  
TO: Chris Lanane, Steve Mobley  
FROM: Mike Horn   
SUBJECT: Quality Assurance Audit Report

Attached is the draft version of the document, "Great Basin Unified Air Pollution Control District Quality Assurance Audit Report, Dirty Socks, May 10, 2011," for your review. Please refer any comments you may have on the document to me by July 11, 2011. If no comments are received by that date, the report will be considered final.

Thank you for your cooperation in this matter.

Great Basin Unified Air Pollution Control District  
Quality Assurance  
Audit Report

SITE:  
**DIRTY SOCKS**

Report Date: May 10, 2011  
Prepared by: Mike S. Horn

## 1.0 Introduction

As part of the Great Basin Unified Air Pollution Control District's (District) quality assurance (QA) program, periodic audits are conducted on the monitoring stations throughout the District. These checks, which are conducted by personnel other than those associated with the day-to-day operation and maintenance of the stations, provide additional assurance that the data collected are of high quality and meet the project objectives. The achievement of these objectives can be determined, in part, by establishing criteria within which monitoring equipment is to be operated and then testing that equipment regularly to verify its operation within those criteria.

In keeping with the District's QA program goals, the T.E.O.M. PM-10 Monitoring Station at Dirty Socks was audited on May 9, 2011. The audit was conducted by Mike Horn and was witnessed by Steve Mobley, who is the site operator.

## 2.0 Parameters Audited:

T.E.O.M. PM-10

## 3.0 Results and Actions

The results of the audit are summarized below. Any problems found are addressed under the heading, "Action," and are given below. Sensor responses not specifically addressed below responded within the audit criteria limits. The audit data are presented in detail in Appendix A. The certifications of the audit devices are presented in Appendix B. Audit criteria based on Title 40 code of Federal Regulations Part 58, Appendix A (October 2006), the USEPA Quality Assurance Handbook for Air Pollution Measurement Systems Volumes II, 1997, and IV, 2007, and/ or on the manufactures recommendations, are presented in table A-1.

## 4.0 Recommendations and Comments

There are no recommendations or comments at this time.

## APPENDIX A

Great Basin Unified Air Pollution Control District  
Tapered Element Oscillating Microbalance (TEOM)  
AUDIT

Date of report: 5/10/11	Site name: Dirty Socks
Date: 5/9/11	Operator: Steve Mobley
Start: 10:10hrs. PST	Project: SB 270
Finish: 10:25hrs. PST	Site Elevation: 3590 ft.
Audited By: Mike Horn	Amb. Pres.: 884.80 hPa
Witness: Steve Mobley	Amb. Temp.: 14.5 deg. C
Prop. or Serial No.: 225500	Make: R & P
Type: PM-10	Model: 1400ab
	Last cal. date: 2/23/11

AUDIT DEVICE(S)

Make: BGI Incorporated  
Model: DELTA CAL  
S/N: 525  
Range: 2 - 20 lpm

Calibration Factors

Slope: 1.00  
Intercept: 0.00  
Cal date: 1/4/11

Main: 0.000      Aux: 0.050

Leak check: N/A      Dark current: N/A

$$Q_a = [dP \times T_a / P_a]^{1/2} + b$$

Make: BGI Incorporated  
Model: DELTA CAL  
S/N: 525  
Range: 2 - 20 lpm

Calibration Factors

Slope: 1.00  
Intercept: 0.00  
Cal Date: 1/4/11

Diff. -0.4      Sampler press: 881.31      Diff. -3.5

Sampler temp: 14.1

Audit Point	Audit Flow Rate, $Q_a = [dP \times T_a / P_a]^{1/2} + b$		Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates	
	$\Delta P$ , in. H <sub>2</sub> O	(VLPM)			Lower Limit (LPM)	Upper Limit (LPM)
Total Flow Rate	16.91	16.91	16.67	-1.4	15.0	18.4
Bypass/Aux Flow Rate	13.94	13.94	13.67	-1.9		
Main Flow Rate	3.07	3.07	3.00	-2.3	2.7	3.3
Total Flow Rate	16.96	16.96	16.67	-1.7	15.0	18.4

Comments: None.

TABLE A-1

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT  
QUALITY ASSURANCE PERFORMANCE AUDIT CRITERIA

<u>Measurement Variable</u>	<u>Evaluation Criteria</u>
Wind Speed	At $ws \leq 5 \text{ m/s}$ , input $\pm 0.25 \text{ m/s}$ ; At $ws > 5 \text{ m/s}$ , input $\pm 5\%$ Starting threshold: $0.5 \text{ m/s}$ ; R. M. Young 05305 Wind Monitor AQ Starting threshold: $1.0 \text{ m/s}$ ; R. M. Young 05103 Wind Monitor and NRG Max 40H
Wind Direction	input $\pm 5^\circ$ Starting threshold: $0.5 \text{ m/s}$ ; R. M. Young 05305 Wind Monitor AQ Starting threshold: $1.0 \text{ m/s}$ ; R. M. Young 05103 Wind Monitor
Temperature	input $\pm 0.5^\circ \text{ C}$ input $\pm 2.0^\circ \text{ C}$ for PM-10, PM-2.5 samplers
Relative Humidity	Ambient: input $\pm 5\% \text{ RH}$ , $\pm 1.5^\circ \text{ C}$ as dew point Gravimetry Lab: input $\pm 5\%$
Precipitation	input $\pm 10\%$
Barometric Pressure	Ambient: input $\pm 10 \text{ hPa}$ TEOM: $\pm 10 \text{ mm mercury}$
PM-10: Hi-Vol SSI, Partisol, BGI, PM-2.5	input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 4\%$ ; Design Flow $\pm 5\%$
TEOM: Total Flow Main Flow Bypass Flow	input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 10\%$ ; Design Flow $\pm 10\%$
TEOM: Leak Check	Main Flow: $< 0.15 \text{ LPM}$ Bypass Flow: $< 0.60 \text{ LPM}$

## Appendix B

### GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT QUALITY ASSURANCE CERTIFICATIONS OF AUDIT DEVICES

<u>AUDIT DEVICE</u>	<u>Serial #</u>	<u>Cal Date:</u>	<u>Slope:</u>	<u>Intercept:</u>
BGI Delta CAL:	123	1/24/11	1.0	0.0
BGI Delta CAL:	525	1/4/11	1.0	0.0
Testo 735-1	01467895/712	12/16/10	1.0006	0.0209
Barigo Altimeter/Barometer:	P9	12/17/10	1.0	0.0
RM Young wind speed motor:	CUO1, HSO1	12/3/10	N/A	N/A
Cole-Parmer 3312-40 Psychrometer:	RH 03	12/10/04	Wet 1.0037	Wet -0.0598
			Dry 1.0059	Dry -0.1518
Texas Electronics FC-525 Precipitation:	52202	N/A		
Chinook Eng. Streamline FTS	108	9/8/10	0.41	0.6

**Great Basin Unified Air Pollution Control District**  
**Tapered Element Oscillating Microbalance (TEOM)**  
**FLOW AUDIT**

Date: 5/9/14  
 Start: 10:10  
 Finish: 10:25

PST  
 PST

Site Name:  
 Operator:  
 Project: SB270

Site Elevation:

Amb. Press.:

Amb. Temp.:

ft  
 in. Hg  
 deg. C

Prop. Or Ser. No.: 22508  
 Type: PM10

Make: R&P  
 Model: 1400a  
 Last Cal. Date: 2/23/14

**Audit Device(s)**

Make: BGI INCORPORATED  
 Model: DELTA CAL  
 S/N: 0123-525  
 Range: 2 - 20 lpm

Make: BGI INCORPORATED  
 Model: DELTA CAL  
 S/N: 0123  
 Range: 2 - 20 lpm

**Calibration factors:**

Slope: 1.0

Int.: 0.0

Cal Date: 1/4/14

**Calibration factors:**

Slope: 1.0

Int.: 0.0

Cal Date:

$$Q_a = m[dP \times T_2 / P_2]^{1/2} + b$$

Altitude Correction Factor:  $\div 1013$

Leak Check-Initial Main: .00  
 Leak Check-Final Main:

Aux: .05  
 Aux:

Audit Point	Audit Flow Rate		Site		Nominal Flow Rates	
	delta P	(VLPM)	Flow Rate (VLPM)	Diff. (%)	Lower Limit (LPM)	Upper Limit (LPM)
Total Flow Rate	16.91		3.00/13.67 = 16.67		15.0	18.4
Aux. Flow Rate	13.94		13.67			
Main Flow Rate	3.87		3.00		2.7	3.3
Total Flow Rate	16.96		16.67		15.0	18.4

	Standard	
	Sampler	Raw
Amb Temp	14.1	15.0
Amb Press	870	881.31

Comments:


Calibrated By:

*Mike Khan*



GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

MEMORANDUM

DATE: January 26, 2011  
TO: Chris Lanane, Steve Mobley  
FROM: Mike Horn   
SUBJECT: Quality Assurance Audit Report

Attached is the draft version of the document, "Great Basin Unified Air Pollution Control District Quality Assurance Audit Report, Dirty Socks, January 26, 2011," for your review. Please refer any comments you may have on the document to me by March 28, 2011. If no comments are received by that date, the report will be considered final.

Thank you for your cooperation in this matter.

Great Basin Unified Air Pollution Control District  
Quality Assurance  
Audit Report

SITE:  
**DIRTY SOCKS**

Report Date: January 26, 2011

Prepared by: Mike S. Horn

## 1.0 Introduction

As part of the Great Basin Unified Air Pollution Control District's (District) quality assurance (QA) program, periodic audits are conducted on the monitoring stations throughout the District. These checks, which are conducted by personnel other than those associated with the day-to-day operation and maintenance of the stations, provide additional assurance that the data collected are of high quality and meet the project objectives. The achievement of these objectives can be determined, in part, by establishing criteria within which monitoring equipment is to be operated and then testing that equipment regularly to verify its operation within those criteria.

In keeping with the District's QA program goals, the T.E.O.M. PM-10 Monitoring Station at Dirty Socks was audited on January 25, 2011. The audit was conducted by Mike Horn and was witnessed by Steve Mobley, who is the site operator.

## 2.0 Parameters Audited:

T.E.O.M. PM-10

## 3.0 Results and Actions

The results of the audit are summarized below. Any problems found are addressed under the heading, "Action," and are given below. Sensor responses not specifically addressed below responded within the audit criteria limits. The audit data are presented in detail in Appendix A. The certifications of the audit devices are presented in Appendix B. Audit criteria based on Title 40 code of Federal Regulations Part 58, Appendix A (October 2006), the USEPA Quality Assurance Handbook for Air Pollution Measurement Systems Volumes II, 1997, and IV, 2007, and/ or on the manufactures recommendations, are presented in table A-1.

## 4.0 Recommendations and Comments

There are no recommendations or comments at this time.

## APPENDIX A

Great Basin Unified Air Pollution Control District  
Tapered Element Oscillating Microbalance (TEOM)  
AUDIT

Date of report: 1/26/11	Site name: Dirty Socks
Date: 1/25/11	Operator: Steve Mobley
Start: 13:00hrs. PST	Project: SB 270
Finish: 13:20hrs. PST	Site Elevation: 3590 ft.
Audited By: Mike Horn	Amb. Pres.: 895.80 hPa
Witness: Steve Mobley	Amb. Temp.: 14.5 deg. C
Prop. or Serial No.: 225500	Make: R & P
Type: PM-10	Model: 1400ab
	Last cal. date: 11/5/10

AUDIT DEVICE(S)

Make: BGI Incorporated  
Model: DELTA CAL  
S/N: 525  
Range: 2 - 20 lpm

Calibration Factors

Slope: 1.00  
Intercept: 0.00  
Cal date: 1/4/11

Main: Aux:

Leak check: -0.010 -0.030  
Dark current: N/A N/A

$$Qa=[dPxTa/Pa]^{1/2}+b$$

Make: BGI Incorporated  
Model: DELTA CAL  
S/N: 525  
Range: 2 - 20 lpm

Calibration Factors

Slope: 1.00  
Intercept: 0.00  
Cal Date: 1/4/11

Diff. Sampler press: Diff.  
-0.8 894.48 -1.3

Sampler temp: 13.7

Audit Point	Audit Flow Rate, $Qa=[dPxTa/Pa]^{1/2}+b$		Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates	
	$\Delta P$ , in. H <sub>2</sub> O	(VLPM)			Lower Limit (LPM)	Upper Limit (LPM)
Total Flow Rate	17.06	17.06	16.67	-2.3	15.0	18.4
Bypass/Aux Flow Rate	14.00	14.00	13.67	-2.4		
Main Flow Rate	3.00	3.00	3.00	0.0	2.7	3.3
Total Flow Rate	17.01	17.01	16.67	-2.0	15.0	18.4

Comments: None.

TABLE A-1

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT  
QUALITY ASSURANCE PERFORMANCE AUDIT CRITERIA

<u>Measurement Variable</u>	<u>Evaluation Criteria</u>
Wind Speed	At $ws \leq 5$ m/s, input $\pm 0.25$ m/s; At $ws > 5$ m/s, input $\pm 5\%$ Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor and NRG Max 40H
Wind Direction	input $\pm 5^\circ$ Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor
Temperature	input $\pm 0.5^\circ$ C input $\pm 2.0^\circ$ C for PM-10, PM-2.5 samplers
Relative Humidity	Ambient: input $\pm 5\%$ RH, $\pm 1.5^\circ$ C as dew point Gravimetry Lab: input $\pm 5\%$
Precipitation	input $\pm 10\%$
Barometric Pressure	Ambient: input $\pm 10$ hPa TEOM: $\pm 10$ mm mercury
PM-10: Hi-Vol SSI, Partisol, BGI, PM-2.5	input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 4\%$ ; Design Flow $\pm 5\%$
TEOM: Total Flow Main Flow Bypass Flow	input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 10\%$ ; Design Flow $\pm 10\%$ input $\pm 10\%$ ; Design Flow $\pm 10\%$
TEOM: Leak Check	Main Flow: $< 0.15$ LPM Bypass Flow: $< 0.60$ LPM

## Appendix B

### GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT QUALITY ASSURANCE CERTIFICATIONS OF AUDIT DEVICES

#### AUDIT DEVICE

	<u>Serial #</u>	<u>Cal Date:</u>	<u>Slope:</u>	<u>Intercept:</u>
BGI Delta CAL:	123	12/22/09	1.0	0.0
BGI Delta CAL:	525	1/4/11	1.0	0.0
Testo 735-1	01467895/712	12/16/10	1.0006	0.0209
Barigo Altimeter/Barometer:	P9	12/17/10	1.0	0.0
RM Young wind speed motor:	CUO1, HSO1	12/3/10	N/A	N/A
Cole-Parmer 3312-40 Psychrometer:	RH 03	12/10/04	Wet 1.0037	Wet -0.0598
			Dry 1.0059	Dry -0.1518
Texas Electronics FC-525 Precipitation:	52202	N/A		

**Great Basin Unified Air Pollution Control District  
Tapered Element Oscillating Microbalance (TEOM)**

**FLOW AUDIT**

Date: 1/25/11  
Start: 13:00  
Finish: 13:26

PST  
PST

Site Name:  
Operator:  
Project: SB270

*John Lacher*  
*Steve Mowley*

Site Elevation: ft  
Amb. Press.: 895.8 in. Hg  
Amb. Temp.: 14.5 deg. C

Prop. Or Ser. No.: 22508  
Type: PM10

Make: R&P  
Model: 1400a

Last Cal. Date: 11/5/10

**Audit Device(s)**

Make: BGI INCORPORATED  
Model: DELTA CAL  
S/N: 0123-525  
Range: 2 - 20 lpm

Make: BGI INCORPORATED  
Model: DELTA CAL  
S/N: 0123  
Range: 2 - 20 lpm

Calibration factors:  
Slope: 1.0  
Int.: 0.0  
Cal Date: 1/4/11

Calibration factors:  
Slope: 1.0  
Int.: 0.0  
Cal Date:

$$Q_s = m[dP \times T_s / P_s]^{1/2} + b$$

Altitude Correction Factor:  $\div 1013$

Leak Check-Initial Main: .01  
Leak Check-Final Main:

Aux: .03  
Aux:

Audit Point	Audit Flow Rate delta P (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates	
				Lower Limit (LPM)	Upper Limit (LPM)

Total Flow Rate	17.06	2.00/13.67 = 16.67		15.0	18.4
Aux. Flow Rate	14.0	13.67			
Main Flow Rate	3.00	3.00		2.7	3.3
Total Flow Rate	17.01	16.67		15.0	18.4

	Sampler	Standard	
		True	Raw
Amb Temp	13.7		14.5
Amb Press	883	894.48	895.8

Comments:

Calibrated By:

*Mike ZK*